presentatives of all the great engineering associations in this country, the duty of which it would be to report as to the best mode of training British engineers in the future. We had at present no proper system of secondary education preparing students for entering technical institutes. In this respect the Germans had certainly stolen a march upon us. We should cease arguing for ever whether the classical side or the modern side of education was the best. The simple solution was that they should go on side by side. There should be a more generous recognition by employers of the necessity and value of the services of trained men. It was a sad thing to know that some of the researches originally made in this country had been first turned to practical account abroad. He knew one case where British manufacturers were to this day paying large royalties in connection with a process of steel manufacture which was actually initiated in England. He looked forward to a system of technical education in London and throughout the country which would show the world that England was still the leader in industry and in resource.

SOCIETIES AND ACADEMIES.

LONDON.

Mathematical Society, January 14.—Dr. E. W. Hobson, vice-president, in the chair.—The following papers were communicated:—Various systems of piling: Prof. J. D. **Everett.** The method of "steps" for dealing with the structure of piles of equal spheres is applied to various arrangements which are of especial interest in crystallography.—The notion of lines of curvature in the theory of surfaces: Dr. G. **Prasad.** The object of the paper is to investigate conditions under which certain known theorems in the theory of surfaces can be extended to the case in which the coordinates of points on the surface are defined by non-analytical functions. The theorems in question are:—(1) The only surface of constant positive curvature is a sphere; (2) no surface of constant negative curvature with continuously varying tangent plane can extend to infinite distances.—Electric radiation from conductors: H. M. **Macdonald.** It is shown that in general, when electrical oscillations on a conductor are taking place, no surface can be drawn to cut the lines of electric force at right angles and to be everywhere close to the surface of the conductor. If such a surface could be drawn there would be no decay of the oscillations by radiation. It is shown that surfaces can be drawn to have the property in question everywhere except near the nodal points of the oscillation, and it is concluded that the radiation takes place mainly in the neighbourhood of the nodes. It is pointed out further that the ordinary theory of electrical waves along wires involves an invalid limiting operation, by which the wires are treated as indefinitely thin and the electric force is taken, nevertheless, to be everywhere at right angles to the wires; and the correction of the ordinary theory required to avoid this operation is discussed.—Groups of the order $p^{\alpha}q^{\beta}$: Prof. W. **Burnside.** By a consideration of certain properties of the group-characteristics of groups of the orders in question, it is shown that all these groups are soluble.—The solution of partial differential equations by means of definite integrals: H. **Bateman.** The paper deals with various generalisations of the known solutions of Laplace's equation by means of definite integrals.—Open sets and the theory of content: Dr. W. H. **Young.** Two definitions of the content of an open set are given, and are shown to be in agreement for that class of open sets which has the property that the content of the set, obtained by adding to any member of the class any set of non-overlapping intervals, is equal to the sum of the contents of the component sets. This class contains all known open sets, and all those obtainable from them by any of the ordinary processes.—Upper and lower integration: Dr. W. H. **Young.** All functions, whether integrable or not, possess upper integrals and lower integrals. The problem of determining them is reduced in the paper to that of ordinary integration. It is shown that an upper n-ple integral of a discontinuous function can be expressed in terms of $\int I dk$, where I is the content of the set of points at which the maximum of the function is not less than k, and the integral is taken between suitable limits.—List of primes of the form $4n+1$ between 10^8 and 10^8+10^3: Dr. T. B. **Sprague.**

PARIS.

Academy of Sciences, January 18.—M. Mascart in the chair.—The application of the general theory of the flow of sheets of water infiltrated in the soil to large springs of permeable strata, and, in particular, to several of those supplying Paris: J. **Boussinesq.** The mathematical theory previously worked out by the author has been applied to the three sources of Dhuis, Cérilly, and Armentières. It is found that for important springs in permeable ground the basin of supply is considerably extended downwards below its edge.—On the first numbers of the photographic catalogue of the sky published by M. Trépied: M. **Lœwy.**—On the dispersion of the n-rays and on their wave-length: R. **Blondlot.** The dispersion was studied by means of aluminium prisms and lenses, and it was recognised that the radiation was separated into eight bundles, the refractive indices of which varied from 1·04 to 1·85. The wave-lengths were determined by two methods: by a diffraction grating and by the formation of Newton's rings. The results of the two methods were concordant within the limits of experimental error, the wave-lengths determined proving to be much shorter than those of light. These radiations would appear to be different from the rays of very short wave-length discovered by M. Schumann, inasmuch as the latter are strongly absorbed by air and the n-rays are not.—On the peroxides of zinc: M. **de Forcrand.** A discussion of the results of M. Kuriloff with regard to the formula of peroxide of zinc.—On a characteristic property of the families of Lamy: Alphonse **Demoulin.**—On the *genre* of the derivative of an entire function and on the exceptional case of M. Picard: A. **Wiman.**—The action of radium bromide on the electrical resistance of bismuth: R. **Paillot.** The radiations emitted by radium bromide diminish the electrical resistance of bismuth. The action is practically instantaneous, rapidly falling off with the distance of the radium tube from the bismuth and vanishing when this distance amounts to 1 cm.—On a self-recording differential speed measurer: J. **Richard.**—The influence of the physical nature of the anode on the constitution of electrolytic peroxide of lead: A. **Hollard.** If the lead were deposited as the dioxide, the analytical factor would be 0·866 to convert the dioxide into lead. Experiments with an anode of roughened platinum gave a factor of 0·853, this being independent of the amount of lead in solution.—The chemical nature of colloidal solutions: Jacques **Duclaux.**—A method of separating alumina and iron by the use of formic acid: A. **Leclère.** A modification of the hyposulphite of sodium method, in which the aluminium is separated as the basic formate.—The estimation of chlorates, bromates, and iodates: Léon **Débourdeaux.**—The preparation of primary alcohols by means of the corresponding amides: L. **Bouveault** and G. **Blanc.** The higher fatty amides, reduced by sodium in boiling ethyl alcoholic solution, give yields of from 25 to 30 per cent. of the theoretical. Normal hexyl, normal nonyl, and phenylethyl alcohols were prepared in this way.—The synthesis of sugars, starting from trioxymethylene and sulphite of soda: A. **Seyewetz** and M. **Gibello.**—A new method of synthesis of tertiary alcohols by means of organomagnesium compounds: V. **Grignard.** The magnesium compound R.MgX is converted into $R.CO_2.MgX$ by the action of carbon dioxide, and this is then treated with an additional molecule of R′.MgX, the object being to prepare the ketone R.CO.R′. The reaction was found, however, to result in the production of the tertiary alcohol $R.R'_2.OH$. The new alcohols prepared by this method include diethylisoamyl carbinol, isobutyldiisoamyl carbinol, and phenyldiethyl carbinol.—The influence of radium rays on the development and growth of the lower fungi: J. **Dauphin.** The radium rays arrest the growth of the mycelium of Mortierella, but the spores and mycelium are not killed, but are in a latent state, and, replaced under normal conditions, can germinate and continue to grow.—Researches on the transpiration of the leaves of Eucalyptus: Ed. **Griffon.** In opposition to the views generally expressed, it is found that the leaves of Eucalyptus have not an unusually large transpiratory capacity com-

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pared with other leaves. The effects of the growth of this tree in marshy soil are more probably due to its power of rapidly producing a large mass of foliage than to any specially large transpiratory effects.—The utilisation of entomophytic fungi for the destruction of larvæ: C. **Vaney** and A. **Conte.**—On the excrescences of the leaves of the vine: P. **Viala** and P. **Pacottet.** These abnormalities are not observed in vineyards, but are produced by forced culture under glass.—On a trachyte in the French Soudan: H. **Arsandaux.** The case described is the first example of volcanic rock in the western French Soudan. Two types of alkaline trachyte and one basalt were found.—The increase of useful work in traction by the use of elastic apparatus: MM. **Ferrus** and **Machart.**—Remarks by M. **Marey** on the preceding paper.—The relation between the appearance of secondary sexual characters and the interstitial testicular gland: P. **Ancel** and P. **Bouin.**—The action of various substances on the glycogeny of the liver: MM. **Doyon** and **Kareff.**—The determination of the value of intraorganic combustion in the parotid gland of the ox in a state of activity and repose: G. **Moussu** and J. **Tissot.**—On the stimulation of nerves by discharges of condensers: M. **Cluzet.**—On certain congenital anomalies of the head, determining a symmetrical transformation of the four extremities (acrometagenesis): V. **Babès.**—On the destruction of the winter egg of Phylloxera: G. **Cantin.**

DIARY OF SOCIETIES.

THURSDAY, JANUARY 28.

ROYAL SOCIETY, at 4.30.—Observations on the Sex of Mice—Preliminary Paper: Dr. S. M. Copeman, F.R.S., and F. G. Parsons.—Observations upon the Acquirement of Secondary Sexual Characters indicating the Formation of an Internal Secretion by the Testicle: S. G. Shattock and C. G. Seligmann.—On the Part played by Benzene in Poisoning by Coal Gas: Dr. R. Staehelin.—On the Islets of Langerhaus in the Pancreas: H. H. Dale.—The Morphology of the Retrocalcarine Region of the Cortex Cerebri: Prof. G. Elliot Smith.

ROYAL INSTITUTION, at 5.—The Flora of the Ocean: G. R. M. Murray, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Edison Accumulator for Automobiles: W. Hibbert. (Adjourned discussion.) To be opened by Dr. J. A. Fleming, F.R.S.—On the Magnetic Dispersion in Induction Motors, and its Influence on the Design of these Machines: Dr. H. Behn-Eschenburg. (Adjourned discussion.)

FRIDAY, JANUARY 29.

ROYAL INSTITUTION, at 9.—The Marshes of the Nile Delta: D. G. Hogarth.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Metallurgy as Applied in Engineering: Archibald B. Head.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Extra Meeting. Sixth Report to the Alloys Research Committee on the Heat Treatment of Steel: the late Sir William C. Roberts-Austen, K.C.B., F.R.S.. Completed by Prof. W. Gowland. (Continued discussion.)

SATURDAY, JANUARY 30.

ROYAL INSTITUTION, at 3.—British Folk Song: J. A. Fuller-Maitland.

ESSEX FIELD CLUB, at 6.30 (Essex Museum of Natural History, Stratford).—Evidences of Prehistoric Man in West Kent: J. Russell Larkby.—Recent Observations concerning London City Walls, the Walbrooke and Moorfields: F. W. Reader.

MONDAY, FEBRUARY 1.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—A Résumé of the Report, Minutes of Evidence, and Appendices of the Royal Commission on Arsenical Poisoning: Julian L. Baker.

SOCIETY OF ARTS, at 8.—Oils and Fats—their Uses and Applications: Dr. J. Lewkowitsch (Cantor Lectures II.).

ARISTOTELIAN SOCIETY, at 8.—Reality: Shadworth H. Hodgson.

TUESDAY, FEBRUARY 2

ROYAL INSTITUTION, at 5.—The Development of Animals: Prof. L. C. Miall, F.R.S.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Sanding-up of Tidal Harbours: A. E. Carey. (Discussion).—Tonnage Laws and the Assessment of Harbour Dues and Charges: H. H. West.

MINERALOGICAL SOCIETY, at 8.—On a New Sulphostannite of Lead from Bolivia, and its Relations with Franckeite and Cylindrite: G. T. Prior.—On the Gnomonic Net: Harold Hilton.

ZOOLOGICAL SOCIETY, at 8.30.—On the Subspecies of *Giraffa camelopardalis*: R. Lydekker, F.R.S.—On a Collection of Mammals from Namaqualand: Oldfield Thomas, F.R.S.—On the Arteries of the Base of the Brain in Certain Mammals: F. E. Beddard, F.R.S.

FARADAY SOCIETY, at 8.—Notes on Aluminium Welding: Sherard Cowper-Coles.—Some Applications of the Theory of Electrolysis to the Separation of Metals from One Another: A. Hollard.

WEDNESDAY, FEBRUARY 3.

SOCIETY OF ARTS, at 8.—Steam Cars for Public Service: Thomas Clarkson.

GEOLOGICAL SOCIETY, at 8.—The Rhætic Beds of the South Wales Direct Line: Prof. S. H. Reynolds and A. Vaughan.—On a Deep-Sea Deposit from an Artesian Boring at Kilacheri, near Madras: Prof. H. Narayana Rau.

ENTOMOLOGICAL SOCIETY, at 8.—On the Habits of some Mantidæ: Captain C. E. Williams.—Systematic Observations upon the Dermatoptera: Malcolm Burr.—Descriptions of New Species of Cryptinæ, from the Khasia Hills, Assam; and a New Species of Bembex: Peter Cameron.—On a New Species of Heterogynis: Dr. T. A. Chapman.—On some New or Imperfectly Known Forms of South African Butterflies: Roland Trimen, F.R.S.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Annual Meeting, followed by Note on the Quantitative Estimation of Mechanical Wood Pulp in Paper: C. F. Cross and E. J. Bevan.—Note on Chinese Tallow Seed Oil: L. Myddelton Nash.—Note on the Analysis of Jam: Raymond Ross.

THURSDAY, FEBRUARY 4.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: The Reduction Division in Ferns: R. Gregory.—Cultural Experiments with "Biologic Forms" of the Erysiphaceæ: E. S. Salmon.—On the Origin of Parasitism in Fungi: George Massee.—On Mechanical and Electrical Response in Plants: Prof. J. C. Bose.—On the Effects of Joining the Cervical Sympathetic Nerve with the Chorda Tympani: Prof. J. N. Langley, F.R.S., and Dr. H. K. Anderson.

ROYAL INSTITUTION, at 5.—Recent Research in Agriculture: A. D. Hall.

CHEMICAL SOCIETY, at 8.—The Tautomeric Character of the Acidic Thiocyanates—Preliminary Note: R. E. Doran.—The Resolution of $\alpha\beta$-Dihydroxybutyric Acid into its Optically Active Constituents: R. S. Morrell and E. K. Hanson.

LINNEAN SOCIETY, at 8.—Account of Researches in the Physiology of Yeast: Prof. Sydney H. Vines F.R.S.—Further Researches on the Specialisation of Parasitism in the Erysiphaceæ: E. S. Salmon.

RÖNTGEN SOCIETY, at 8.30.—Discussion on the Production of Photographic Reversal through the Action of Various Radiations.

SATURDAY, FEBRUARY 6.

ROYAL INSTITUTION, at 3.—Study of Style in Greek Sculpture: Dr. C. Waldstein.

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